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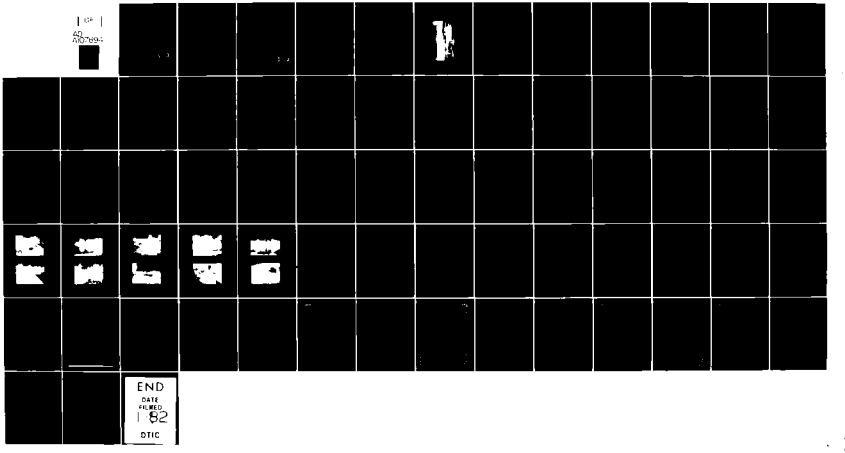

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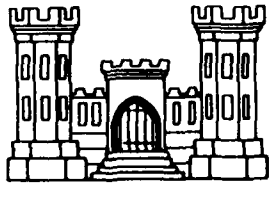
NO NAME 262 DAM

JEFFERSON COUNTY, MISSOURI

MO 30461

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

JANUARY 1979

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: No Name 262 Dam (Mo. 30461), Phase I Inspection Report

This report presents the results of field inspection and evaluation of No Name 262 Dam (Mo. 30461).

It was prepared under the National Program of Inspection of Non-Federal Dams.

The St. Louis District has classified this dam as unsafe because of excessively steep downstream embankment slopes as evidenced by slumping material, prevalence of seepage, and the size and extent of trees growing on the embankment.

SUBMITTED BY: SIGNED — 12 MAR 19[illegible]
Chief, Engineering Division — (Date)

APPROVED BY: SIGNED — 12 MAR [illegible]
Colonel, CE, District Engineer — (Date)

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	No Name 262 Dam, Missouri Inv. No. 30461
State Located:	Missouri
County Located:	Jefferson
Stream:	Unnamed Tributary of Isum Creek
Date of Inspection:	October 1 and 3, 1978

Assessment of General Condition

No Name 262 Dam No. Mo. 30461 was inspected using the "Recommended Guidelines for Safety Inspection of Dams". These guidelines were developed by the Chief of Engineers, U.S. Army, Washington, D.C., with the help of Federal and State agencies, professional engineering organizations, and private engineers. The resulting guidelines are considered to represent a consensus of the engineering profession.

Based on criteria in the guidelines, the dam is in the high hazard potential classification, which means that loss of life and appreciable property loss could occur in the event of failure of the dam. Four houses and three private road crossings would be subjected to flooding, with possible damange and/or destruction, and possible loss of life. No Name 262 Dam is in the small size classification since it is less than 40 feet high and impounds less than 1,000 acre-feet of water.

Our inspection and evaluation indicates that the spillway of No Name 262 Dam meets the criteria set forth in the guidelines for a dam having the above size and hazard potential. No Name 262 Dam is a small size dam with a high hazard potential required by the guidelines to pass from one-half Probable Maximum Flood to the Probable Maximum Flood without overtopping. It was determined that the spillway will pass the Probable Maximum Flood without overtopping the dam. Our evaluation indicates that the spillway will pass the 100-year flood; that is, a flood having a 1 percent chance of being equalled or exceeded during any given year.

The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reaonsably possible in the region.

Deficiencies noted by the inspection team were a need for periodic inspection by a qualified professional engineer; lack of a maintenance schedule; a need for a complete seepage and stability analyses of the dam embankment; brush and tree growth on the embankment crest and side slopes; and heavy vegetative growth on the spillway crests.

It is recommended that the owner take action to correct or control the deficiencies described above.

Walter G. Shifrin, P.E.

NONAME 262 DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

No Name 262 Dam, I.D. No. 30461

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NATIONAL DAM SAFETY PROGRAM

NO NAME 262 DAM, Missouri Inv. No. 30461

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The Dam Inspection Act, Public Law 92-367 of August, 1972, authorizes the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspections. Inspection for the No Name 262 Dam was carried out under Contract DACW 43-78-C-0160 to the Department of the Army, St. Louis District, Corps of Engineers, by the engineering firms of Consoer, Townsend & Associates Ltd., and Engineering Consultants, Inc. (A Joint Venture), of St. Louis, Missouri.

b. Purpose of Inspection

The visual inspection of the No Name 262 Dam was made on October 1, and October 3, 1978. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam embankment and its appurtenant structures.

c. Scope of Report

This report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the field inspection; presents an evaluation of hydrologic and hydraulic conditions at the site; presents an evaluation as to the structural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

It should be noted that reference in this report to left or right abutments is as viewed looking downstream. Where left abutment or left side of the dam is used in this report, this also refers to west abutment or side, and right to the east abutment or side.

d. Evaluation Criteria

Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams", Appendix D. These guidelines were developed with the help of several Federal agencies and many State agencies, professional engineering organizations, and private engineers.

1.2 Description of Project

a. Description of Dam and Appurtenances

It should be noted that design drawings are not available for the dam or appurtenant structures. The following description is based exclusively on observations and measurements made during the visual inspection.

The dam embankment is likely a homogeneous earthfill structure. The crest of the embankment has a typical width of 8 feet and a length of 356.5 feet. The crest elevation is set at 604.5 feet above MSL, and the maximum height of the embankment is 30.5 feet above the minimum streambed elevation along the centerline of the dam.

The embankment section is constructed with side slopes of 1V to 2-1/2H upstream and 1V to 1-1/2H downstream. Riprap was not provided for protection of the upstream embankment slopes.

The embankment material was found to be sandy clay with traces of silt. The material would be classified as CL by the Unified Soil Classification System.

Bedrock at the site and within the vicinity is composed of Ordovician age sandstones with minor interbedded limestones. The gently rolling hills adjacent to the site are mantled by a residual silty, fine-grained sand, a weathered product of the bedrock. Alluvial deposits are encountered along the stream courses of the area.

The abutments for the dam are founded in the residual sands, and alluvial deposits form the foundation on which the embankment is placed. The minimal excavation for the spillway, on the west side of dam, has exposed a few thin beds of limestone within the residual sands.

Data is not available to provide a description of the foundation preparation for the dam.

There are two spillways for the No Name 262 reservoir. The service spillway is located at the left abutment of the dam embankment. This spillway consists of a trapezoidal section which has a 5 (five) foot bottom width and side slopes of 1V to 1.5H on the left bank and 1V to 1H on the right bank. A 12-inch reinforced concrete pipe is buried immediately under the trapezoidal section. The spillway discharge channel is also an unlined earth cut section with approximately the same cross section as the spillway crest. The discharge channel joins the natural stream channel near the downstream toe of the dam.

The emergency spillway is an unlined open channel located at the right abutment which has a bottom width of 21 feet and side slopes of 1V to 3H. The spillway discharge channel runs perpendicular to the dam axis and joins a natural depression about 300 feet downstream from the spillway crest.

A sketch showing the relative elevation of the dam crest and the spillway is given as a plate in this report.

No outlet structure is provided at the damsite.

The reservoir at No Name 262 Dam impounds about 35 acre-feet from a drainage of 0.039 square miles.

b. Location

No Name 262 Dam is located on an unnamed tributary of Isum Creek, Jefferson County, Missouri. The nearest community located downstream of the dam is Cedar Hill, Missouri, which is about 3 miles downstream of the lake. The dam and reservoir are shown on Belew Creek Quandrangle Sheet (7.5 minute series) in Section 20, Township 42 North, Range 4 East.

c. Size Classification

According to the "Recommended Guidelines for Safety Inspection of Dams", by the U.S. Department of the Army, Office of the Chief Engineer the dam is classified in the dam size category as being "Small" since its storage is less than 1,000 acre-feet. The dam is also classifed as "Small" in dam height category because its height is less than 40 feet. The overall size classification is, accordingly, "Small" in size.

d. Hazard Classification

The dam has been classified as having "High" hazard potential in the National Inventory of Dams, on the basis that in the event of failure of the dam or its appurtenances, excessive damage could occur to downstream property, together with the possibility of the loss of life. Our findings concur with the classification. The estimated damage zone extends three miles downstream of the dam. Within the first one and one-half miles downstream of the dam are four houses and three private road crossings. It appears that these houses are

located at an elevation somewhat higher than the No Name 262 Dam reservoir. The impoundment capacity of the dam is small and, as such, no hazard to the town of Cedar Hill is expected in the event of failure of No Name 262 Dam.

e. Ownership

No Name 262 Dam is owned by Mr. Lambert C. Bequette, P. O. Box 336, Adelanto, California 92301.

f. Purpose of Dam

The purpose of the dam is for recreation and as a water supply for livestock.

g. Design and Construction History

The dam was designed and constructed in 1967 by Norman Goad, of Norman Goad Construction Company. No formal plans and specifications were made for the dam.

h. Normal Operational Procedures

The dam is used to impound water for recreational use and water supply for livestock. Water levels are controlled by the capacity of the spillway, rainfall, evaporation and runoff. There is no operation required at the reservoir, and the lake is kept as full as possible at all times.

1.3 Pertinent Data

a. Drainage Area (Acres): 25

b. Discharge at Damsite

Estimated experienced maximum flood (cfs): (Estimated spillway capacity assuming 2 feet of freeboard.)	160
Estimated ungated spillway capacity at maximum pool elevation (cfs):	960

c. Elevation (Feet above MSL)

Top of dam:	604.5
Spillway crest:	600.0
Minimum streambed elevation at centerline of dam:	574.0
Maximum tailwater:	Unknown

d. Reservoir

Length of maximum pool (feet):	640

e. Storage (Acre-Feet)

Top of dam:	51

f. Reservoir Surface (Acres)

Top of dam:	6
Spillway crest:	3

g. Dam

Type:	Earth Embankment
Length:	356.5 feet
Height (maximum):	30.5 feet
Top width: (Varies)	8 feet (typical)

Side slopes:	
Downstream	1V to 1-1/2H
Upstream	1V to 2-1/2H
Zoning:	Unknown
Impervious core:	Unknown
Cutoff:	Unknown
Grout curtain:	Unknown

h. Diversion and Regulating Tunnel — None

i. Spillway

Type:	Uncontrolled
Length of weir (feet):	
Service Spillway	5
Emergency Spillway	21
Crest Elevation (feet above MSL):	
Service Spillway	600
Emergency Spillway	601.5

j. Regulating Outlets — None

SECTION 2: ENGINEERING DATA

2.1 Design

Design drawings are not available for the dam or appurtenant structures. The dam was designed and constructed in 1967 by Norman Goad Construction Company of House Springs, Missouri. No drawings nor designs were made for the dam or appurtenant structures.

2.2 Construction

No construction data is available for the dam and appurtenant structures.

2.3 Operation

No operation data is available for No Name 262 Dam.

2.4 Evaluation

a. Availability

No design drawings, design computations, construction data or operation data is available.

In addition, no pertinent data was available for review of hydrology spillway capacity, flood routing through the reservoir, outlet capacity, slope stability, seepage analysis, or foundation conditions.

b. Adequacy

The available engineering data is inadequate to aid in evaluating the hydraulic and hydrologic capabilities and stability of the dam for Phase I investigations.

The lack of engineering data did not allow for a definitive review and evaluation. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing and evaluating design, operation, and construction data, but is based primarily on visual inspection, past performance history, and sound engineering judgment.

Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity

No valid engineering data is available.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

A visual inspection of No Name 262 Dam was made on October 1, and October 3, 1978. The following persons were present during the inspection:

Name	Affiliation	Disciplines
Yin Au-Yeung	Engineering Consultants, Inc.	Project Engineer, Hydraulics and Hydrology
David Bramwell	Engineering Consultants, Inc.	Geology
Jon Diebel	Engineering Consultants, Inc.	Soils
John Ismert	Engineering Consultants, Inc.	Mechanical
Kevin Blume	Consoer, Townsend & Assoc., Ltd.	Civil & Structural

Specific observations are discussed below.

b. Dam

The crest of the dam was found to have widths varying from 5 to 8 feet. A large amount of vegetation was observed on the crest, including trees and large brush.

The upstream embankment slope has a heavy vegetative cover. This vegetation again includes trees and heavy brush. One large tree 12 inches in diameter is located near the center of the dam on the upstream slope. No serious water erosion or sloughing was observed on this slope.

The downstream embankment slope appears to be generally unstable. The side slope is between 1V to 1-1.5H. Slumping is prevalent along the entire length of the dam. These slumps generally began near the crest and extend down the slope for heights of between 5 and 10 feet. Some slides extended into the dam crest, helping cause the variation in the crest width. Other slumps were seen in the embankment just above the downstream toe. The slope itself is overgrown with trees and large brush. Some trees were observed to have diameters as large as 18 inches. Minor rodent activity was also observed on the embankment.

Seepage was seen in many areas downstream of the toe of the embankment. A small flow estimated at 0.10 gpm was observed in the spillway discharge channel from seepage through the banks of the channel which runs parallel to the toe of the dam. Moist areas with some ponding water was found all along the downstream toe of the dam. This was most prevalent in the thalweg and from that area toward the right abutment. Some of the slumps on the embankment slope just above the toe of the dam are possibly caused by seepage on the slope, but heavy vegetation and rainfall in the vicinity prior to the inspection made exact determination impossible.

c. Appurtenant Structures

(1) Spillway

The service spillway crest was covered with heavy grass, brush and trees as can be seen in Photo 7 in Appendix A. The 12-inch reinforced concrete pipe was completely clogged with debris and grass. The spillway discharge channel was also covered with heavy vegetation, and exhibited very minor erosion at the bends. The

emergency spillway, which is located on the right abutment of the dam, was also covered with grass and brush, but vegetation was not as thick and dense as those on the service spillway area. It was not felt necessary to provide erosion protection measures for the dam embankment from low spillway flows.

(2) Outlet Works

No outlet works or low level drain are provided at the damsite.

d. Reservoir Area

The water level was at elevation 598.5 above MSL at the time of inspection.

The majority of the reservoir shore in the immediate area of the dam shows no sign of instability. However, there are several slumping and eroded areas at the left bank of the reservoir approximately 250 feet upstream from the service spillway. The slumping area does not appear to be of any danger to the stability of the dam and reservoir, but will increase potential sedimentation problems.

e. Downstream Channel

The downstream natural channel is well defined. Cross section of the channel is trapezoidal with bottom width of 15 feet and side slopes 1V to 2.5H on both sides. Some fallen tree trunks were noted in the channel floor.

3.2 Evaluation

The following items were observed which could affect the safety of the dam, or which will require maintenance within a reasonable period of time.

1. The generally unstable condition of the downstream embankment slope demonstrated by the extensive slumping of the embankment materials.

2. The seepage prevalent downstream of the toe of the embankment.

3. Trees and large brush growing on the crest and slopes of the dam embankment.

4. Condition of service and emergency spillways. The spillways are overgrown with brush and trees, and the concrete pipe is filled with debris.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

No set policy or procedure of operation is practiced at this lake and dam. Water levels are kept as high as the spillway, rainfall, evaporation rate, and runoff will permit.

4.2 Maintenance of Dam

It is not certain if any maintenance has been performed on the dam or spillway since its construction in 1967. Several items were observed as needing maintenance and correction. All trees and large brush should be cleared from the downstream and upstream slopes. This also holds true for the channels and crests of the service and emergency spillways. The general stability of the downstream slope is questionable, and corrective measures should be taken as soon as possible.

No records are kept concerning maintenance or water levels.

4.3 Maintenance of Operating Facilities

There are no facilities at the lake which require operation or maintenance. The lake is used for recreational purposes and livestock water supply.

4.4 Description of Any Warning System in Effect

The inspection team is not aware of any existing warning system in effect.

4.5 Evaluation

Based on the condition of the dam at the time of inspection, it appears that the operation and maintenance of the damsite is inadequate. It is the opinion of the inspection team that the corrective measures outlined in Paragraph 4.2 should be implemented as soon as possible.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

No hydrologic design data is available.

No Name 262 Dam has a watershed of approximately 25 acres. Land gradients in the watershed average roughly 15 percent. The lake lies on an unnamed tributary of Isum Creek.

Elevations within the watershed range from approximately 590 feet above MSL at the damsite to over 670 feet above MSL in the upper portion of the watershed.

The watershed is approximately 50 percent covered with forest, with the remainder being covered by grass and brush. A drainage map showing the watershed area is included in Appendix B.

Evaluation of the hydraulic and hydrologic features of No Name 262 Dam was based on criteria set forth in the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, and additional guidance provided by the St. Louis District of the Corps of Engineers. The Probable Maximum Flood (PMF) was calculated from the Probable Maximum Preciptation (PMP) using the methods outlined in the U.S. Weather Bureau Publication, Hydrometerological Report No. 33. The probable maximum storm duration was set at 24 hours, and storm rainfall distribution was based on criteria given in

EM 1110-2-1411 (Standard Project Storm). The SCS triangular hydrograph, transformed to a curvilinear hydrograph, was adopted for developing the unit hydrograph. The derived unit hydrograph is presented in Appendix B.

Initial and infiltration loss rates were applied to the PMP to obtain rainfall excesses. The rainfall excesses were then applied to the unit hydrograph to obtain the PMF hydrograph, utilizing the Corps of Engineers' computer program HEC-1 (Dam Safety Version), which was prepared specifically for dam safety analysis. The computed peak discharge of the PMF and one-half of the PMF are 756 cfs and 378 cfs, respectively.

Both the PMF and one-half of the PMF inflow hydrographs were routed through the reservoir by the Modified Puls Method, also utilizing the HEC-1 (Dam Safety Version) computer program. The peak outflow discharges for the PMF and one-half of the PMF are 345 cfs and 147 cfs, respectively. Both the PMF and one-half of the PMF, when routed through the reservoir, resulted in no overtopping of the dam.

The stage-outflow relation for the spillways were prepared from field notes and sketches. The reservoir stage-capacity data were based on the U.S.G.S. quadrangle topographic maps. Reservoir storage capacity included surcharge levels exceeding the top of the dam, and the spillway rating curve assumed that the dam remains intact during routing. In the routing computations, the discharge through the 12-inch R.C.P. was excluded due to its insignificant magnitude as compared to the spillway discharge and the PMF. The spillways and overtop rating curve and the reservoir capacity curve are also presented in Appendix B.

b. Experience Data

No records of reservoir stage or spillway discharge are maintained for this site. However, according to interviews with local residents, the maximum reservoir level was never higher than the crest of the embankment.

c. Visual Observations

No seepage was visible in the areas of the spillways. Both the service spillway and the emergency spillway need extensive clearing of brush and tree growth to maintain adequate hydraulic efficiency for the spillway in case of flood. There are no drawdown facilities to evacuate the reservoir. The spillway and exit channel for both the spillways are located at the furthermost abutments, and releases from the spillways will not pose danger to the integrity of the dam.

d. Overtopping Potential

As indicated in Section 5.1-a., both the Probable Maximum Flood and one-half of the Probable Maximum Flood, when routed through the reservoir, resulted in no overtopping of the dam. The PMF and one-half of the PMF, when routed through the reservoir has freeboards of 1.09 feet and 2.19 feet, respectively. The spillways of the No Name 262 Dam are capable of passing a flood equal to the PMF with over 1 foot of freeboard. The magnitude of the peak is about eight times larger than a 100-year frequency flood peak. Since one-half of the PMF is the minimum Spillway Design Flood (SDF) for No Name 262 Dam, according to the Recommended Guidelines for Safety Inspection of Dams by the Corps, the spillway capacity of the dam is considered "Adequate".

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The downstream embankment slope appears to be unstable. The slope is as steep as 1V to 1H in places, which is not felt to be a satisfactory slope for the material used for the embankment. The prevalent slumping is an indication of an unstable cross-section.

The seepage prevalent downstream of the toe of the dam, and possibly on the embankment slope, is a further condition indicating a potential hazard. Seepage can reduce stability of the downstream slope and/or may lead to piping (internal erosion).

The extensive brush and tree growth present on the crest and side slopes could eventually pose a hazard to the embankment. This heavy vegetation prevents proper inspection of the dam embankment, including identification of moisture and seepage, in addition to the problems inherent with trees allowed to grow on dam embankments.

No sign of structural instability or distress was observed on either spillway. However, there was minor erosion on the bends of the service spillway discharge channel. This area will probably require some reshaping and repair following a major flood.

b. Design and Construction Data

No design or construction data relating to the structural stability of the dam or appurtenant structures was found.

c. Operating Records

No operating records are available relating to the stability of the dam or appurtenant structures. Water levels have not been recorded, however, the reservoir is assumed to be close to full at all times. No operating facilities exist at the damsite.

d. Post Construction Changes

No post construction changes are known which will affect the structural stability of the dam.

e. Seismic Stability

In general projects located in Seismic Zones 0, 1 and 2 can be assumed to present no hazard from earthquake, provided the static stability conditions are satisfactory and conventional safety margins exist. No Name 262 Dam is located in Seismic Zone 1. A detailed seismic analysis is not felt to be necessary for this embankment.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

It should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is also important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that an unsafe condition could be detected.

a. Safety

The capacity of the spillways of No Name 262 Dam were found to be adequate to safely pass the PMF. However, the overall structural condition of the dam embankment is questionable. The constructed cross-section is not in compliance with what would normally be considered as an acceptable design. The 1V to 1-1/2H downstream slope is very steep, even for a dam 30 feet high. The slopes are generally uneven and irregular, and the crest width varies considerably. The

extensive slumping on the downstream slope is indicative of an unstable slope. No data indicating construction techniques, embankment material or foundation conditions and treatment is available, however, the extensive seepage appearing downstream of the embankment toe indicates that foundation preparation may not have been satisfactory. A stability study should be done by a professional engineer experienced in design and construction of earthfill dams, to determine the stability of the embankment.

The heavy brush and tree growth on the embankment slopes pose a potential hazard to the dam. The extensive tree growth is considered unsatisfactory in terms of dam safety for several reasons: First, trees toppled by wind expose holes that invite rapid erosion, and second, decay of large existing root systems could form channels for eventual piping.

The heavy vegetative growth on the service and emergency spillway crests inhibit the hydraulic efficiency of these structures. Clearing of this vegetation and preventing future growth should be undertaken.

The spillways and the exit channels are located at the two abutments. Low flows through the spillways should not pose danger to the dam embankment.

b. Adequacy of Information

Information concerning the dam and appurtenant structures is not available. It is recommended that the following programs be initiated to help alleviate this problem:

1. Periodic inspection of the dam by a professional engineer experienced in the design and construction of earthen dams should be made, and this inspection report made a matter of record.

2. Set up a maintenance schedule and log all visits to the dam for repairs and maintenance.

c. Urgency

The remedial measures recommended in Paragraph 7.2 should be accomplished in the near future.

The stability analysis of the embankment is of more urgent nature than the other recommended actions.

d. Necessity for Phase II Inspection

Based on results of the Phase I inspection, and if the remedial measures recommended in Paragraph 7.2 are undertaken as soon as possible, a Phase II inspection is not felt to be necessary.

7.2 Remedial Measures

a. A complete stability study of the dam embankment should be undertaken as soon as possible. This study should evaluate the structural stability of the embankment section under maximum loading conditions. Due to the lack of data available, the study must include some test holes and piezometer installations. Information concerning foundation materials, soil properties of the embankment materials, and

data on the phreatic line is necessary to adequately assess the embankments structural stability under all conditions.

b. The crest and embankment slopes, as well as the spillway crests, should be cleared of all trees and large brush. Because of the size and extent of trees, coupled with the apparent instability, clearing should be done under the guidance of a professional engineer. Indiscriminate clearing methods could create an unsafe situation.

c. O & M Maintenance Procedures

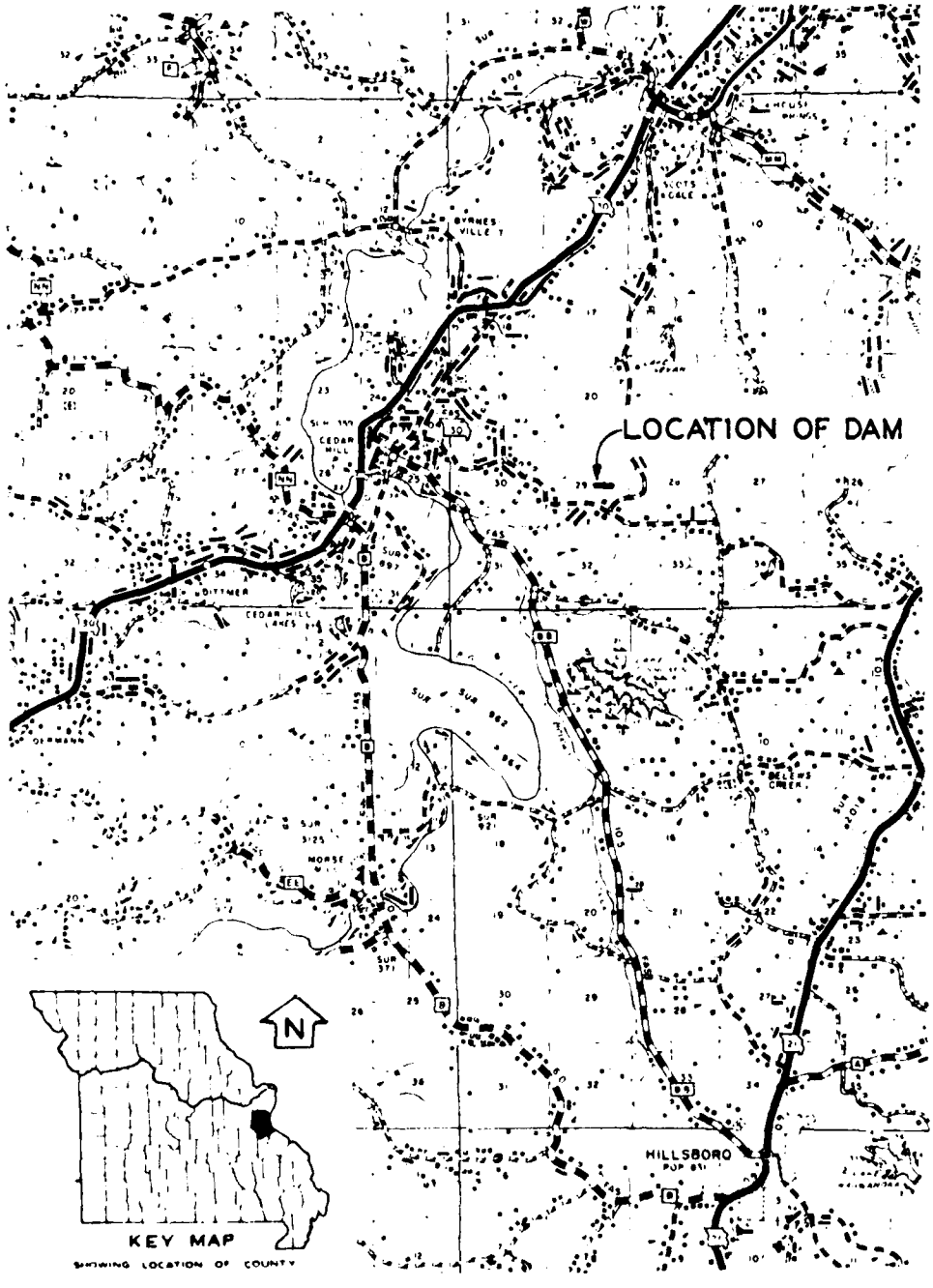
The owner should initiate the following programs:

1. Periodic inspection of the dam by a professional engineer experienced in the design and construction of earthen dams.

2. Set up a maintenance schedule and log all visits to the dam for repairs and maintenance.

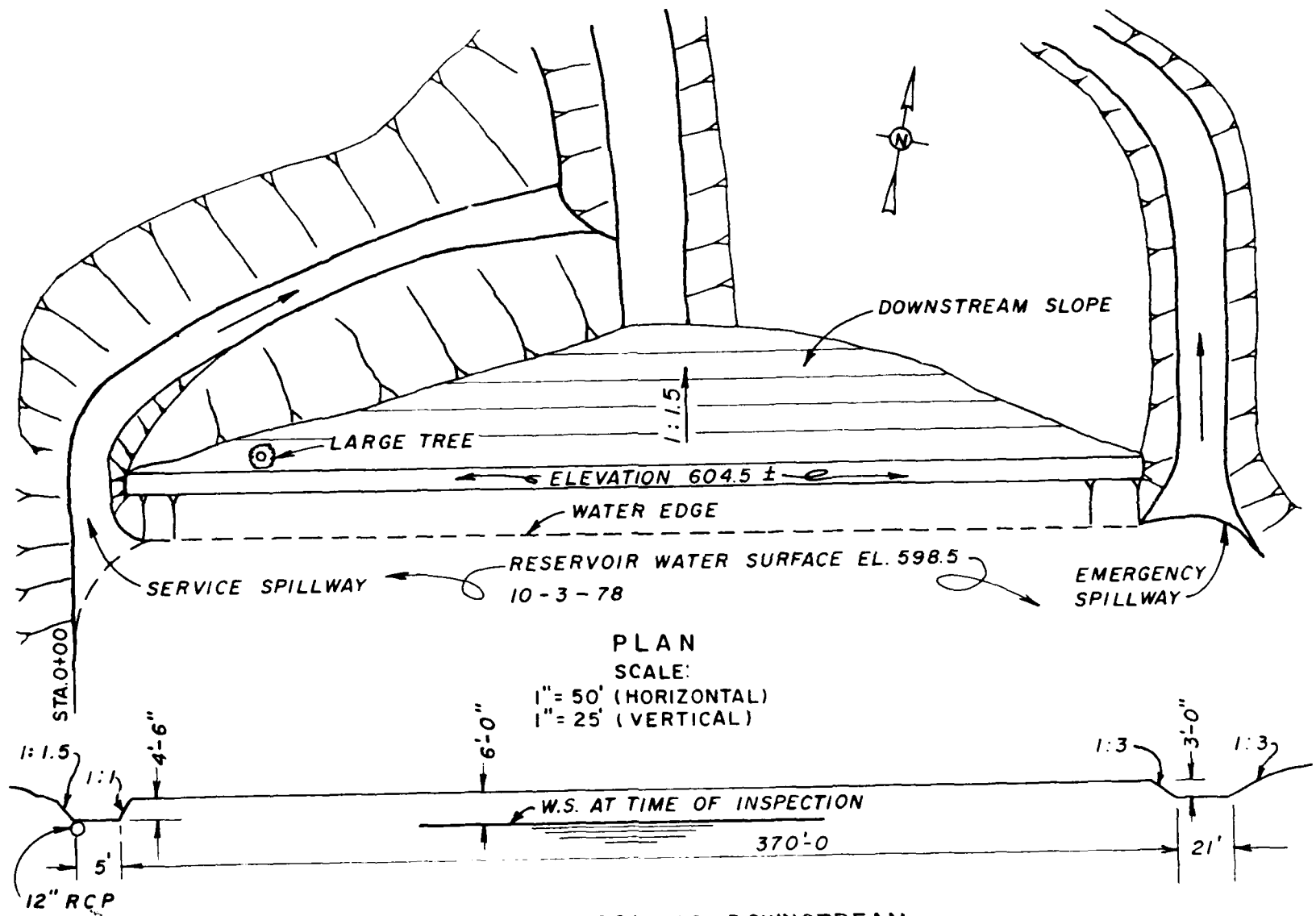
3. Clear the heavy vegetative growth from the crests of the service and emergency spillways. The concrete pipe in the service spillway should also be unplugged.

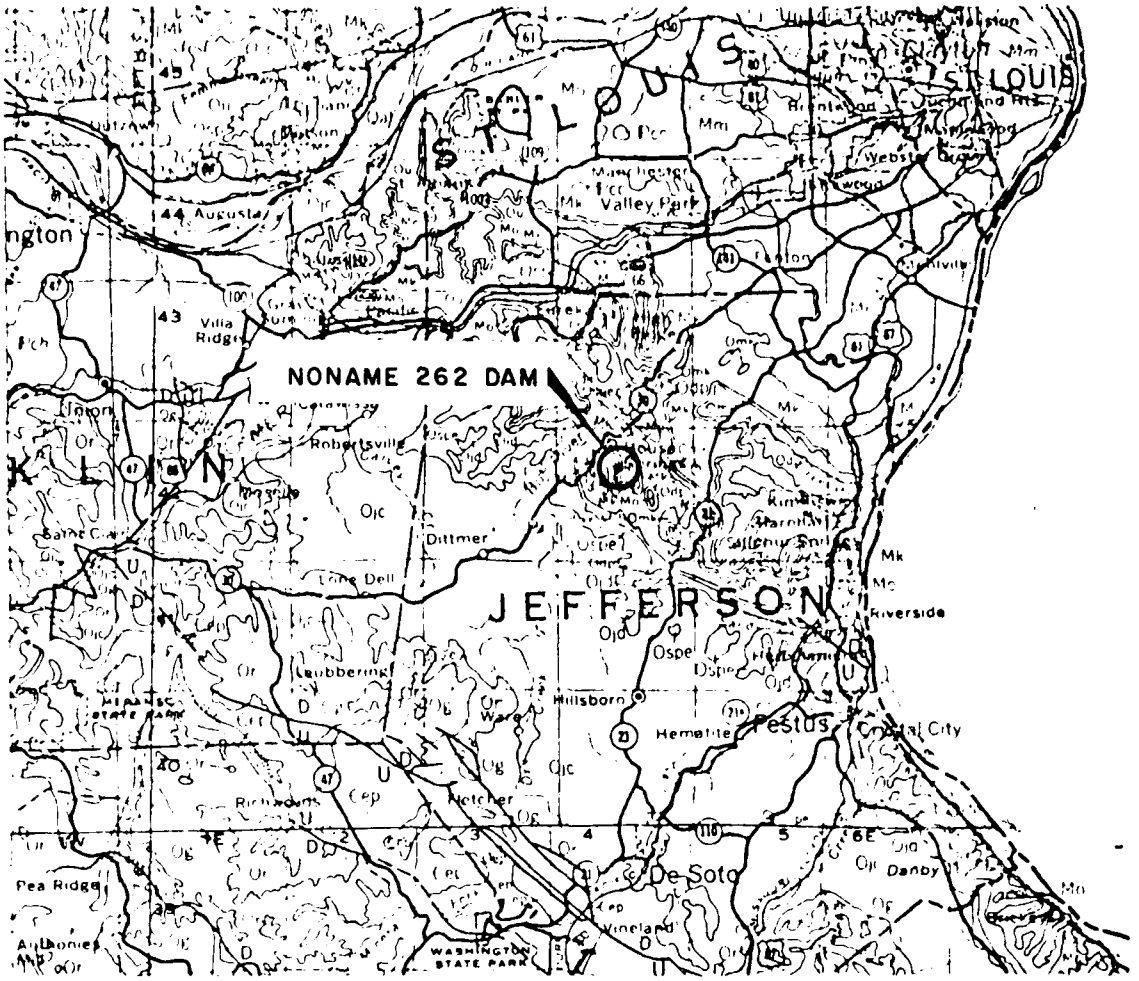
PLATES



LOCATION MAP
NONAME 262 DAM
JEFFERSON COUNTY, MISSOURI

NONAME 262 DAM
RELATIVE ELEVATIONS





General Geologic Map

Explanation

Mississippian System

M_o - cherty and crinoidal limestone, with some shale.
M_k - intercalated limestones and shales.

Ordovician System

O_{mk} - shale and limestone.
O_{dp} - shale with thin fossiliferous limestone beds and dense limestone.
O_{jd} - dolomite with interbedded limestone, shale, and black limestone.
O_{spe} - massive, cross-bedded sandstone; and dolomite, lithographic limestone with interbedded sandstone.
O_{jc} - silty and cherty dolomite with oolitic chert.
O_r - sandstone, chert, and interbedded dolomite.
O_g - cherty dolomite with a basal sandstone.

Reference: Geologic Map of Missouri, 1961, Division of Geological Survey and Water Resources, State of Missouri.

APPENDIX A

PHOTOGRAPHS TAKEN DURING INSPECTION

NO NAME 262 DAM

Photo 1 - View along crest of dam embankment taken at left abutment.

Photo 2 - View along upstream slope of embankment taken at left abutment.

Photo 3 - View of upstream slope of embankment taken at right abutment.

Photo 4 - Picture of typical section of downstream embankment slope.

Photo 5 - Picture of spillway channel at right side of dam looking downstream.

Photo 6 - Picture of spillway channel at right side of dam looking downstream toward lake.

Photo 7 - Picture of spillway channel at left side of dam looking downstream.

Photo 8 - Picture of concrete pipe in spillway channel at left side of dam.

Photo 9 - Picture of left bank of reservoir. Note sloughing and erosion of bank.

Photo 10 - Close-up of slumping area at left bank of reservoir.

Photo 1 - View along crest of dam embankment taken at left abutment.

Photo 2 - View along upstream slope of embankment taken at left abutment.

Photo 3 - View of upstream slope of embankment taken at right abutment.

Photo 4 - Picture of typical section of downstream embankment slope.

Photo 5 - Picture of spillway channel at right side of dam looking downstream.

Photo 6 - Picture of spillway channel at right side of dam looking downstream toward lake.

Photo 7 - Picture of spillway channel at left side of dam looking downstream.

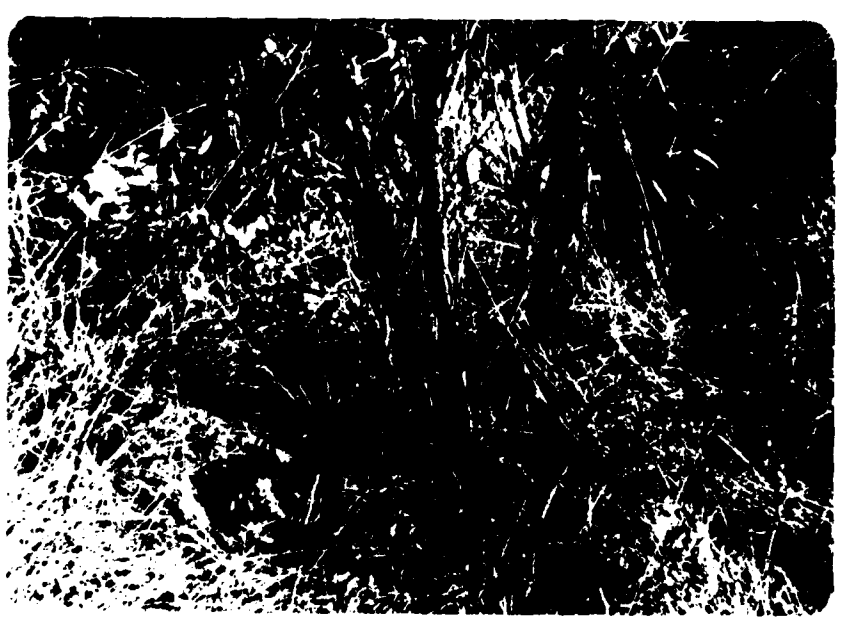


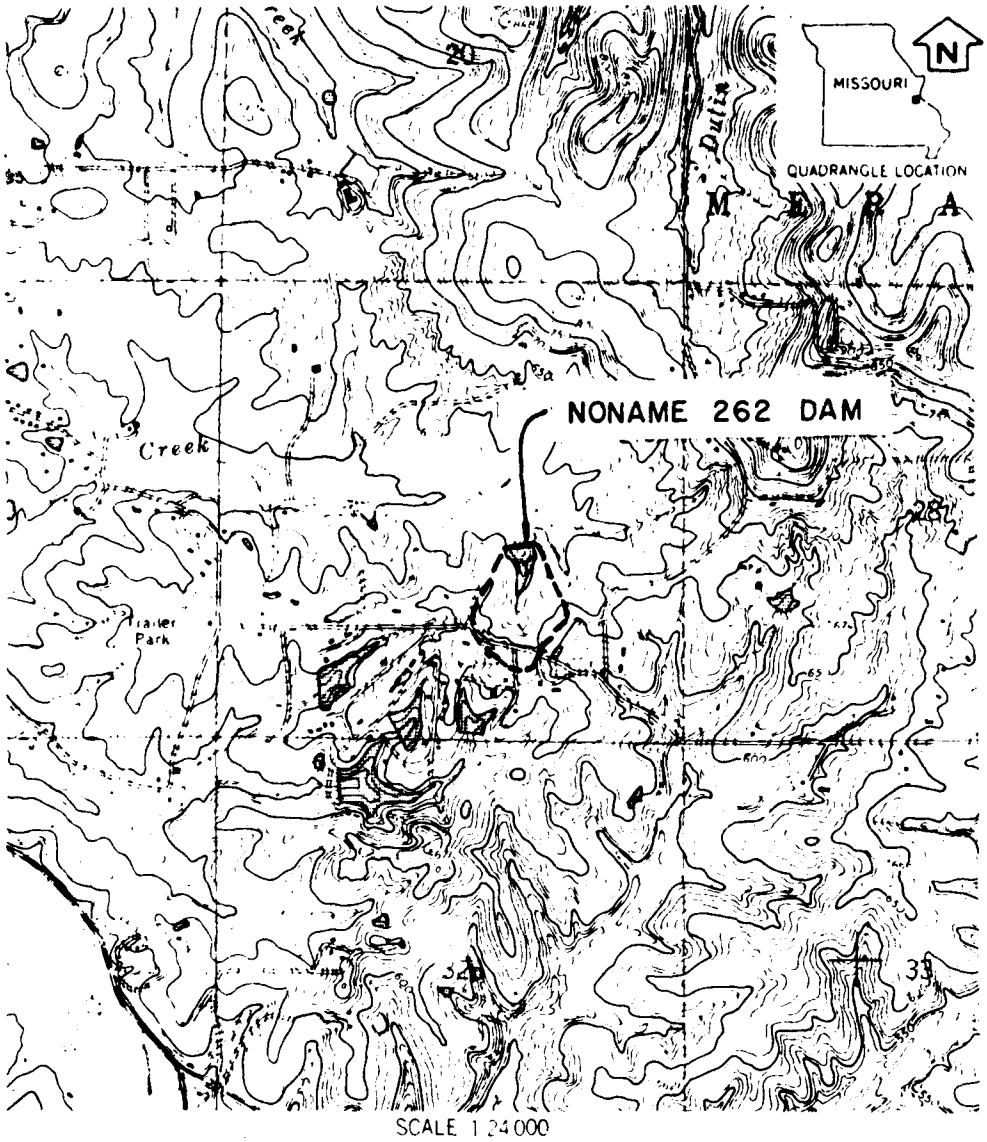
Photo 8 - Picture of concrete pipe in spillway channel at left side of dam.

Photo 9 - Picture of left bank of reservoir. Note sloughing and erosion of bank.

Photo 10 - Close-up of slumping area at left bank of reservoir.

APPENDIX B

HYDROLOGIC COMPUTATIONS



SCALE 1:24000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 10 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

DRAINAGE BOUNDARY — — — —

NONAME 262 DAM
DRAINAGE BASIN

ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION — MISSOURI
NO NAME 262 DAM
RESERVOIR AREA CAPACITY DATA

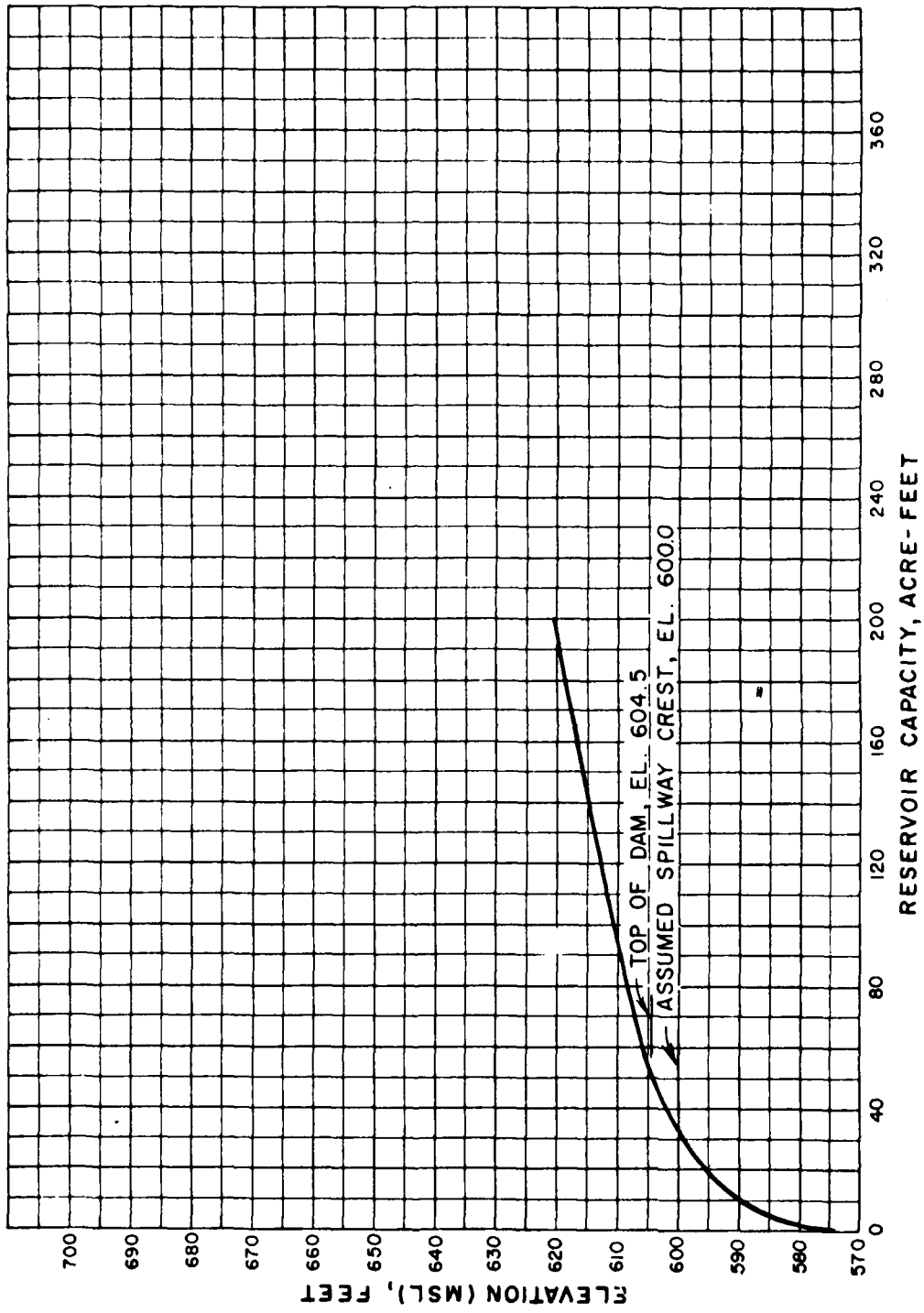
SHEET NO. 1 OF
JOB NO. 1223-001-1
BY KLB DATE 11-16-78

NO NAME 262 DAM

RESERVOIR AREA CAPACITY DATA

ELEVATION FT.	RESERVOIR SURFACE AREA (ACRES)	INCREMENTAL VOLUME (AC-FT)	TOTAL VOLUME (AC-FT)	REMARKS
574	0	-	0	
600	3	31	31**	ASSUMED SPILLWAY CREST ELEVATION
604.5	5.8*	19.8	50.8	TOP OF DAM ELEVATION
610	9	40.7	91.5	AREA MEASURED ON U.S.G.S. MAP
620	13	110.0	201.5	AREA MEASURED ON U.S.G.S. MAP

* INTERPOLATED DATA
** DATA FROM INVENTORY SHEET

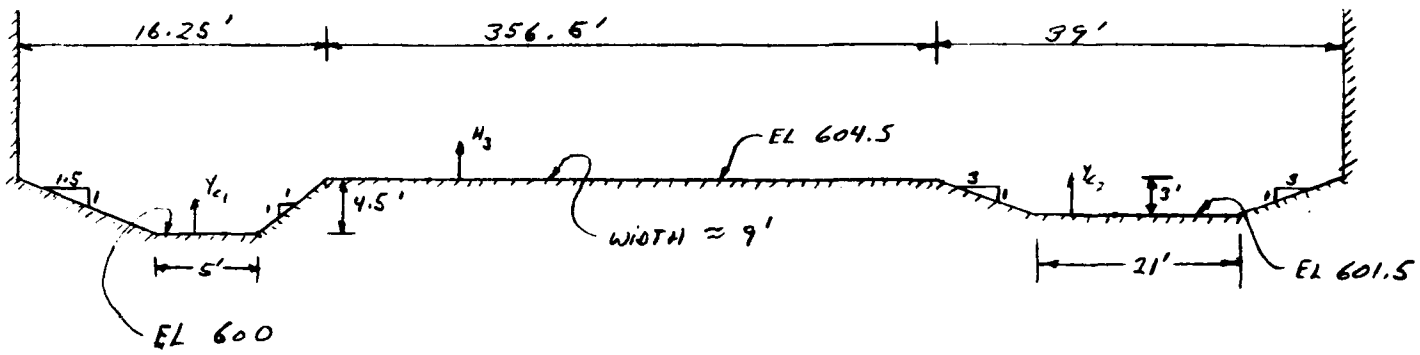


NONAME 262 DAM
RESERVOIR CAPACITY CURVE

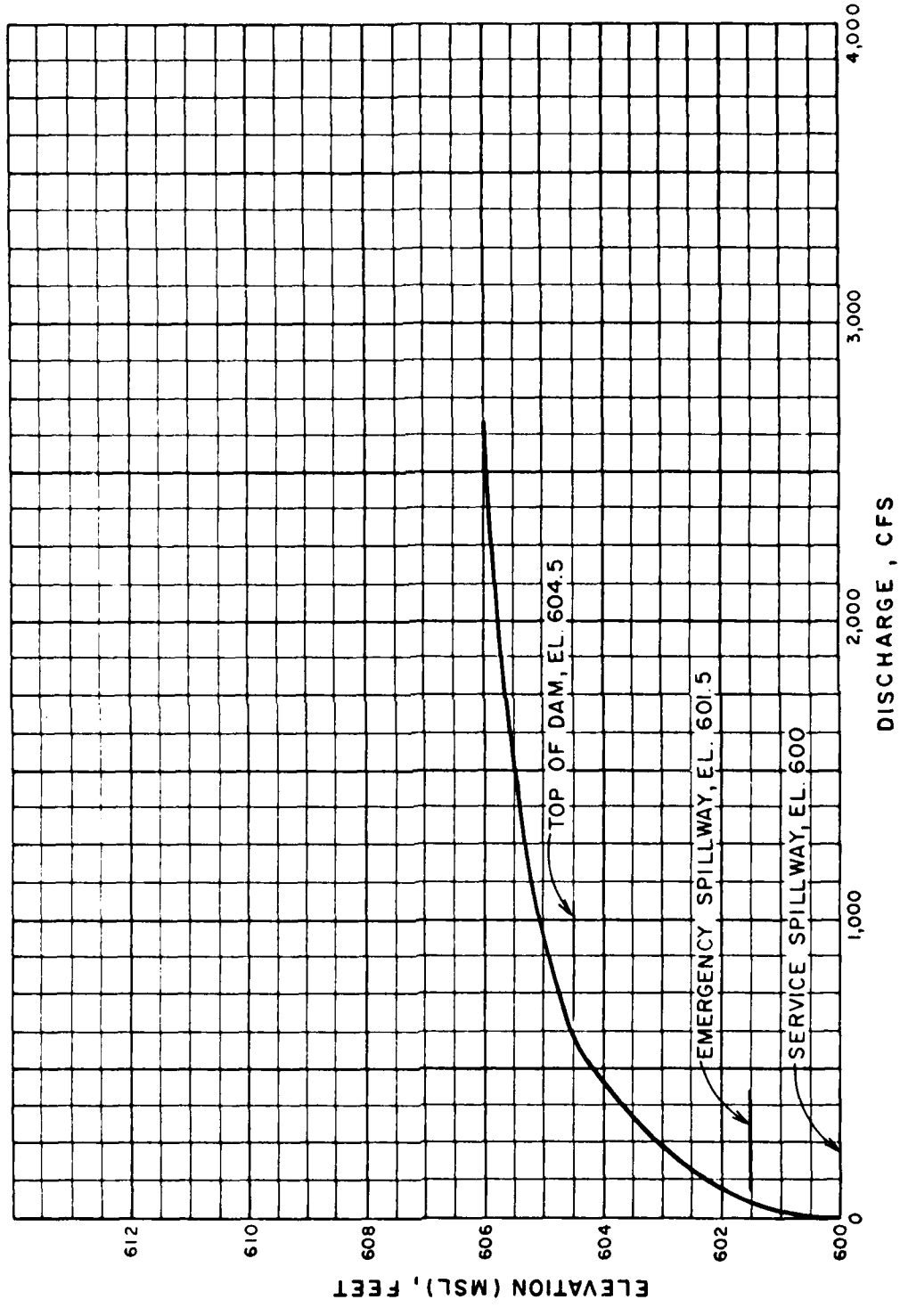
ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - MISSOURI
NONAME 262 DAM
SPILLWAY AND OUTFLOW DISCHARGE CAPACITY

SHEET NO. 1 OF 2
JOB NO. 1223-001
BY ALB DATE 11-30-



Y_{c1}	T_{c1}	A_{c1}	$V_{c1} = 5.67 \sqrt{\frac{A_{c1}}{T_{c1}}}$	$\frac{V_{c1}^2}{2g}$	$Q_1 = A_{c1} V_{c1}$	U.S. W.S. EL = $600 + Y_{c1} + V_{c1}^2/2g$	Approx Y_{c2}	T_{c2}	A_{c2}	$V_{c2} = 5.67 \sqrt{\frac{A_{c2}}{T_{c2}}}$	$Q_2 = A_{c2} Y_{c2}$	H_3	C_3	L_3	Q_3	$Q_T = Q_1 + Q_2 + Q_3$
1.0	7.5	6.25	5.18	0.42	32	601.42										32
2.0	10.0	15.0	6.94	0.75	104	602.75	0.83	25.98	19.92	4.96	99					203
3.0	12.5	26.25	8.22	1.05	216	604.05	1.70	31.20	40.80	6.48	265					481
3.5	13.75	32.81	8.76	1.19	287	604.69	2.13	33.76	51.12	6.98	357	0.19	2.49	356.5	74	718
4.0	15.0	40.0	9.26	1.33	370	605.33	2.55	36.30	61.20	7.36	451	0.83	2.69	356.5	358	1179
4.5	16.25	47.81	9.73	1.47	465	605.97	2.98	38.86	71.52	7.69	550	1.47	2.64	356.5	1677	2692



NONAME 262 DAM
SPILLWAY & OVERTOP RATING
CURVE

ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - MISSOURI — SHEET NO. 1 OF 3
NONAME 262 DAM — JOB NO. 1223-001.1
UNIT HYDROGRAPH PARAMETERS — BY KLB — DATE 11-6-18

1 DRAINAGE AREA = 25 ACRES = 0.039 SQ. MI

2. LENGTH OF STREAM, $L = 0.4'' \times 2000'/5280 = 0.152$ MI.

3 DIFFERENCE IN ELEV., $\Delta H = 677 - 600 = 77$ FT.

4. TIME OF CONCENTRATION

$$T_c = \left(\frac{11.9 \times L^3}{\Delta H}\right)^{0.385}$$

$$T_c = \left(\frac{11.9 \times 0.152^3}{77}\right)^{0.385}$$

$T_c = 0.055$ HR

5. LAG TIME, $L_t = 0.6 \times T_c$

$L_t = 0.6 \times 0.056 = 0.033$ HR

6. RAINFALL UNIT DURATION

$D \leq \frac{L_t}{4} = \frac{0.033}{4} = 0.008$ HR

USE $D = 5$ MIN $= 0.083$ HR

MINIMUM DURATION CRITERIA

7. TIME TO PEAK, T_p

$T_p = \frac{D}{2} + 0.6 \times T_c$

$T_p = \frac{0.083}{2} + 0.6 \times 0.055$ $\quad 0.075$ HR

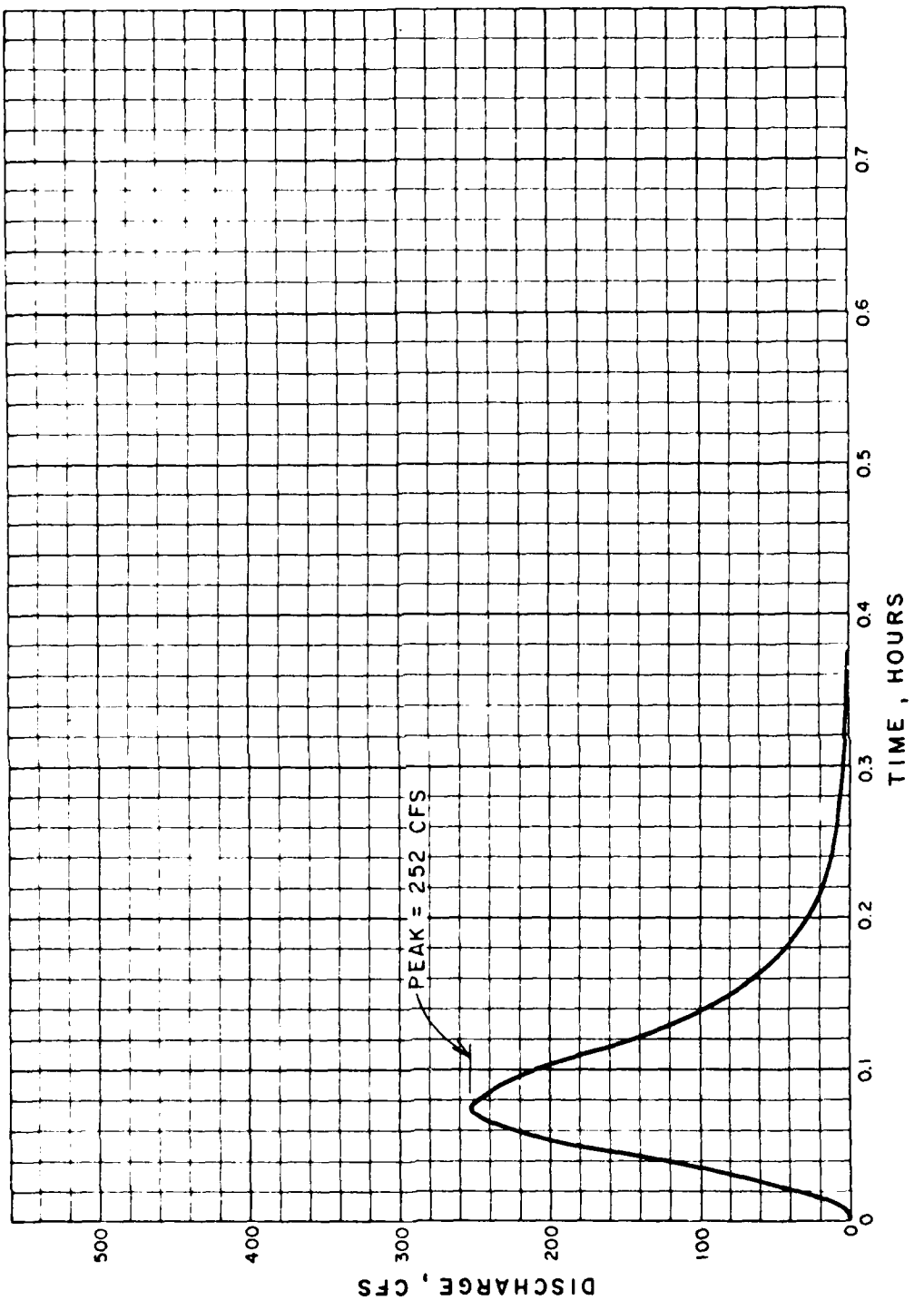
8 $q_p = \frac{484 \times A}{T_p} = \frac{484 \times 0.039}{0.075} = 252$ CFS

FCI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - MISSOURI SHEET NO. 2 OF 3
NO NAME 262 DAM JOB NO. 1223-001-1
UNIT HYDROGRAPH DERIVATION BY KLB DATE 11-6-78

9) CURVILINEAR UNIT HYDROGRAPH

TIME T/Tp	DISCHARGE RATIO Q/Qp	UNIT HYDROGRAPH TIME, T (HR)	UNIT HYDROGRAPH DISCHARGE (CFS)
0.000	0.000	0.000	0.000
0.1	0.015	0.008	3.78
0.2	0.075	0.015	18.90
0.3	0.16	0.023	40.32
0.4	0.28	0.030	70.56
0.5	0.45	0.038	113.40
0.6	0.60	0.045	151.20
0.7	0.77	0.053	194.04
0.8	0.89	0.060	224.28
0.9	0.97	0.068	244.44
1.0	1.00	0.075	252.00
1.1	0.98	0.083	246.96
1.2	0.92	0.090	231.84
1.3	0.84	0.098	211.68
1.4	0.75	0.105	189.00
1.5	0.66	0.113	166.32
1.6	0.56	0.120	141.12
1.8	0.42	0.135	105.84
2.0	0.32	0.150	80.64
2.2	0.24	0.165	60.48
2.4	0.18	0.180	45.36
2.6	0.13	0.195	32.76
2.8	0.098	0.210	24.70
3.0	0.075	0.225	18.90
3.5	0.036	0.263	9.07
4.0	0.018	0.300	4.54
4.5	0.009	0.338	2.27
5.0	0.004	0.375	1.01



NONAME 262 DAM
5 MINUTE UNIT HYDROGRAPH

DETERMINATION OF PMS

1. Determine drainage area of the basin

   D. A. = 25 acres = 0.039 Sq. mi.

2. Determine PMP Index rainfall:

   Location of centroid of basin:

   Long. 90.597°; Lat.: 38.345°

   → PMP for 200 Sq. mi. & 24 hrs duration

   = 25.5" (from Fig 1, HMR NO 33)

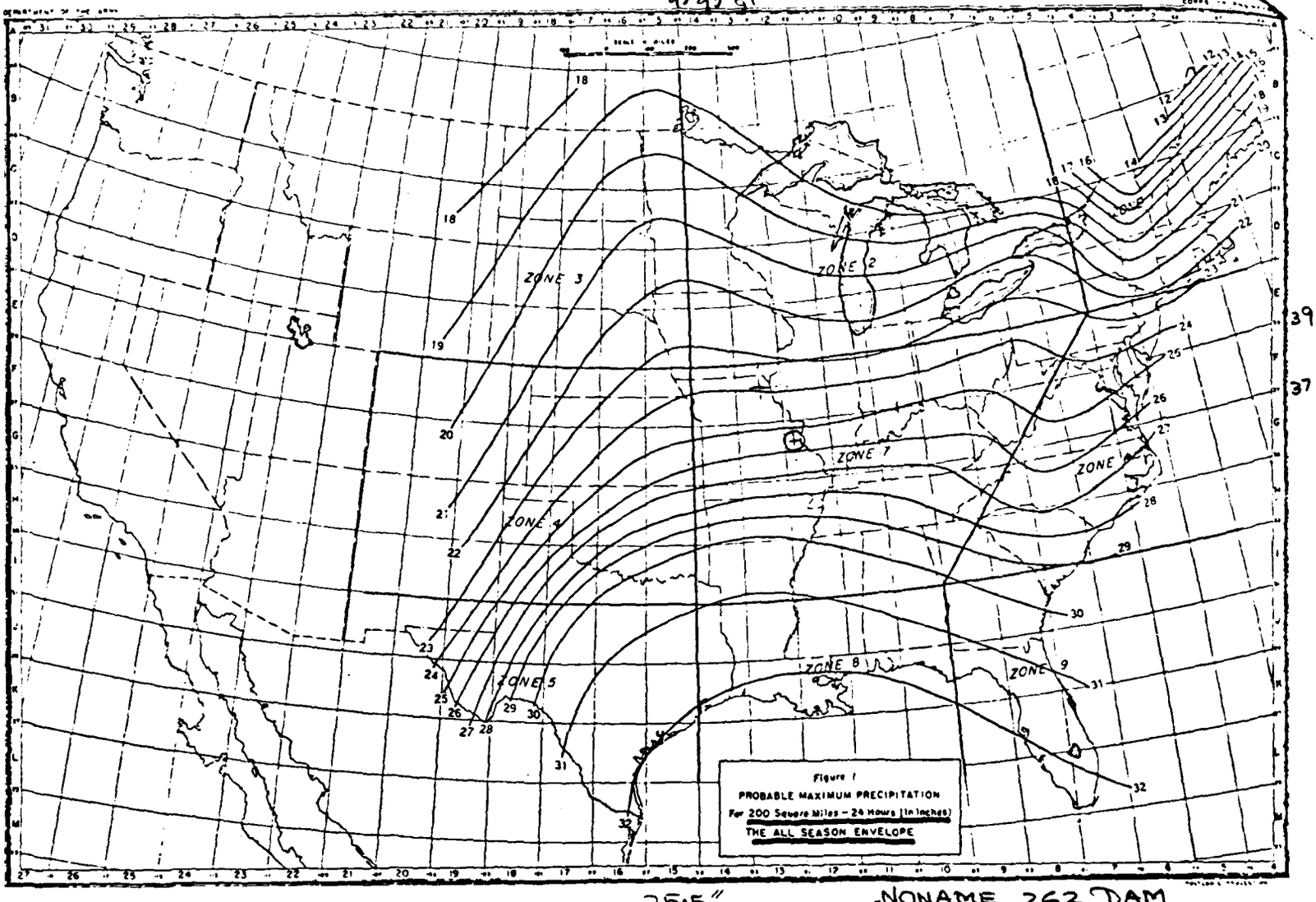
3. Determine basin rainfall interms of percentage of PMP Index rainfall for various durations:

   Location: Long. 90.597°; Lat. 38.345°

   ⇒ Zone 7

Duration (Hrs.)	Percent of Index rainfall (%)	Total rainfall (Inches)	Rainfall increments (Inches)	Duration of increment (Hrs.)
6	100	25.5	25.5	6
12	120	30.6	5.1	6
24	130	33.2	2.6	12

95 93 91



25.5"

NONAME 262 DAM
DETERMINATION OF PMP

292

ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION – MISSOURI
NONAME 262 DAM
100 YEAR FLOOD BY REGRESSION EQUATION

SHEET NO. 1 OF 1
JOB NO. 1223-001-1
BY KLB DATE 11-20-78

NO NAME 262 DAM

100 YEAR FLOOD BY REGRESSION EQUATION

REGRESSION EQUATION FOR 100 YEAR FLOOD FOR MISSOURI:

$$Q_{100} = 85.1\, A^{0.934\, A^{-0.02}}\, S^{0.576}$$

WHERE

A = DRAINAGE AREA IN SQ. MI.

S = MAIN CHANNEL SLOPE, FT/MI
(AVG. SLOPE BETWEEN 0.1 L AND 0.85 L,
L, BEING LENGTH OF MAIN STREAM)

FOR NO NAME 262 DAM

A = 0.039 SQ. MI.

$$S = \frac{648 - 608\ \text{ft}}{0.75 \times 0.152\ \text{mi}} \quad \frac{40}{.11} = 350.88\ \text{ft/mi}$$

$$Q_{100} = 85.1\,(0.039)^{0.934\,(0.039)^{-0.02}}\,(350.88)^{0.576}$$

$$= 98\ \text{CFS}$$

HEC1DB INPUT DATA

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  21 AUG 78
**********
    1              A1                    DAM SAFETY INSPECTION - MISSOURI
    2              A2                          NONAME 262 DAM
    3              A3                 PMF AND 50 PERCENT PMF DETERMINATION AND ROUTING
    4              R     300       0       5       0       0       0       0       0       0       0
    5              RI      5
    6              J       1       2       1
    7              J1    1.0     0.5
    8              K       1      17                                                       1
    9              K1     INPUT PMP INDEX PRECIPITATION AND RATIOS, INPUT SCS UNIT HYDROGRAPH
   10              M       1      -1   0.000                  0.039     1.0
   11              P            25.5     100     120     130
   12              T                                                            1.00    0.08
   13              U       5
   14              UI    0.0     252      42       .       1     0.0
   15              V              0.      1
   16              K       1      17                       2                       1
   17              K1     ROUTE HYDROGRAPH THROUGH NONAME 262 DAM
   18              Y                                       1       1
   19              Y1      1                                                    -800.      -1
   20              Y4600.00  601.42  602.75  604.05  604.50  60-.69  605.33  609.97
   21              Y5    0.0      32     203     481     600     718    1179    2692
   22              S8    0.0      31    50.8    91.5   201.5
   23              SE    574     600   604.5     610     620
   24              S8    600
   25              SD  604.5
   26              K      99
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	17
ROUTE HYDROGRAPH TO	17
END OF NETWORK	

INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 21 AUG 78
****

RUN DATE= 78/11/30.
TIME= 13.29.37.

DAM SAFETY INSPECTION - MISSOURI
SUBAME 262 DAM
PMF AND 50 PERCENT PMF DETERMINATION AND ROUTING

JOB SPECIFICATION

NC	NMIN	IMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	5	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1
RTIOS= 1.00 .50

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INPUT PMP INDEX PRECIPITATION AND RATIOS, INPUT SCS UNI

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
17	0	0	0	0	3	1	0	0

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.04	0.00	.04	1.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	25.50	100.00	120.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.08	0.00	0.00

GIVEN UNIT GRAPH, NUMGO= 5

0. 252. 42. 6. 1.
UNIT GRAPH TOTALS 301. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

0 MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	END-OF-PERIOD FLOW MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	0.00	.01	0.	1.01	12.35	151	.21	.21	.01	82.
1.01	.10	2	.01	0.00	.01	0.	1.01	12.40	152	.21	.21	.01	82.

1.01	.15	3	.01	0.00	.01	0.	1.01	12.45	153	.21	.21	.01	62.
1.01	.20	4	.01	0.00	.01	0.	1.01	12.50	154	.21	.21	.01	62.
1.01	.25	5	.01	0.00	.01	0.	1.01	12.55	155	.21	.21	.01	62.
1.01	.30	6	.01	0.00	.01	0.	1.01	13.00	156	.21	.21	.01	62.
1.01	.35	7	.01	0.00	.01	0.	1.01	13.05	157	.26	.25	.01	62.
1.01	.40	8	.01	0.00	.01	0.	1.01	13.10	158	.26	.25	.01	73.
1.01	.45	9	.01	0.00	.01	0.	1.01	13.15	159	.26	.25	.01	74.
1.01	.50	10	.01	0.00	.01	0.	1.01	13.20	160	.26	.25	.01	75.
1.01	.55	11	.01	0.00	.01	0.	1.01	13.25	161	.26	.25	.01	75.
1.01	1.00	12	.01	0.00	.01	0.	1.01	13.30	162	.26	.25	.01	75.
1.01	1.05	13	.01	0.00	.01	0.	1.01	13.35	163	.26	.25	.01	75.
1.01	1.10	14	.01	0.00	.01	0.	1.01	13.40	164	.26	.25	.01	75.
1.01	1.15	15	.01	0.00	.01	0.	1.01	13.45	165	.26	.25	.01	75.
1.01	1.20	16	.01	0.00	.01	0.	1.01	13.50	166	.26	.25	.01	75.
1.01	1.25	17	.01	0.00	.01	0.	1.01	13.55	167	.26	.25	.01	75.
1.01	1.30	18	.01	0.00	.01	0.	1.01	14.00	168	.26	.25	.01	75.
1.01	1.35	19	.01	0.00	.01	0.	1.01	14.05	169	.32	.31	.01	75.
1.01	1.40	20	.01	0.00	.01	0.	1.01	14.10	170	.32	.31	.01	91.
1.01	1.45	21	.01	0.00	.01	0.	1.01	14.15	171	.32	.31	.01	93.
1.01	1.50	22	.01	0.00	.01	0.	1.01	14.20	172	.32	.31	.01	94.
1.01	1.55	23	.01	0.00	.01	0.	1.01	14.25	173	.32	.31	.01	94.
1.01	2.00	24	.01	0.00	.01	0.	1.01	14.30	174	.32	.31	.01	94.
1.01	2.05	25	.01	0.00	.01	0.	1.01	14.35	175	.32	.31	.01	94.
1.01	2.10	26	.01	0.00	.01	0.	1.01	14.40	176	.32	.31	.01	94.
1.01	2.15	27	.01	0.00	.01	0.	1.01	14.45	177	.32	.31	.01	94.
1.01	2.20	28	.01	0.00	.01	0.	1.01	14.50	178	.32	.31	.01	94.
1.01	2.25	29	.01	0.00	.01	0.	1.01	14.55	179	.32	.31	.01	94.
1.01	2.30	30	.01	0.00	.01	0.	1.01	15.00	180	.32	.31	.01	94.
1.01	2.35	31	.01	0.00	.01	0.	1.01	15.05	181	.19	.19	.01	94.
1.01	2.40	32	.01	0.00	.01	0.	1.01	15.10	182	.39	.38	.01	62.
1.01	2.45	33	.01	0.00	.01	0.	1.01	15.15	183	.39	.38	.01	106.
1.01	2.50	34	.01	0.00	.01	0.	1.01	15.20	184	.58	.57	.01	113.
1.01	2.55	35	.01	0.00	.01	0.	1.01	15.25	185	.68	.67	.01	163.
1.01	3.00	36	.01	0.00	.01	0.	1.01	15.30	186	1.65	1.64	.01	196.
1.01	3.05	37	.01	0.00	.01	0.	1.01	15.35	187	2.71	2.71	.01	445.
1.01	3.10	38	.01	0.00	.01	0.	1.01	15.40	188	1.07	1.06	.01	756.
1.01	3.15	39	.01	0.00	.01	0.	1.01	15.45	189	.68	.67	.01	391.
1.01	3.20	40	.01	0.00	.01	0.	1.01	15.50	190	.58	.57	.01	232.
1.01	3.25	41	.01	0.00	.01	0.	1.01	15.55	191	.39	.38	.01	182.
1.01	3.30	42	.01	0.00	.01	0.	1.01	16.00	192	.39	.38	.01	185.
1.01	3.35	43	.01	0.00	.01	0.	1.01	16.05	193	.30	.29	.01	116.
1.01	3.40	44	.01	0.00	.01	0.	1.01	16.10	194	.30	.29	.01	92.
1.01	3.45	45	.01	0.00	.01	0.	1.01	16.15	195	.30	.29	.01	88.
1.01	3.50	46	.01	0.00	.01	0.	1.01	16.20	196	.30	.29	.01	88.
1.01	3.55	47	.01	0.00	.01	0.	1.01	16.25	197	.30	.29	.01	88.
1.01	4.00	48	.01	0.00	.01	0.	1.01	16.30	198	.30	.29	.01	88.
1.01	4.05	49	.01	0.00	.01	0.	1.01	16.35	199	.30	.29	.01	88.
1.01	4.10	50	.01	0.00	.01	0.	1.01	16.40	200	.30	.29	.01	88.
1.01	4.15	51	.01	0.00	.01	0.	1.01	16.45	201	.30	.29	.01	88.
1.01	4.20	52	.01	0.00	.01	0.	1.01	16.50	202	.30	.29	.01	88.
1.01	4.25	53	.01	0.00	.01	0.	1.01	16.55	203	.30	.29	.01	88.
1.01	4.30	54	.01	0.00	.01	0.	1.01	17.00	204	.30	.29	.01	88.
1.01	4.35	55	.01	0.00	.01	0.	1.01	17.05	205	.23	.23	.01	88.
1.01	4.40	56	.01	0.00	.01	0.	1.01	17.10	206	.23	.23	.01	71.
1.01	4.45	57	.01	0.00	.01	0.	1.01	17.15	207	.23	.23	.01	69.
1.01	4.50	58	.01	0.00	.01	0.	1.01	17.20	208	.23	.23	.01	68.
1.01	4.55	59	.01	0.00	.01	0.	1.01	17.25	209	.23	.23	.01	68.
1.01	5.00	60	.01	0.00	.01	0.	1.01	17.30	210	.23	.23	.01	68.
1.01	5.05	61	.01	0.00	.01	0.	1.01	17.35	211	.23	.23	.01	68.
1.01	5.10	62	.01	0.00	.01	0.	1.01	17.40	212	.23	.23	.01	68.

1.01	5.15	63	.01	0.00	.01	0.	1.01	17.45	213	.23	.23	.01	68.
1.01	5.20	64	.01	0.00	.01	0.	1.01	17.50	214	.23	.23	.01	68.
1.01	5.25	65	.01	0.00	.01	0.	1.01	17.55	215	.23	.23	.01	68.
1.01	5.30	66	.01	0.00	.01	0.	1.01	18.00	216	.23	.23	.01	68.
1.01	5.35	67	.01	0.00	.01	0.	1.01	18.05	217	.02	.01	.01	68.
1.01	5.40	68	.01	0.00	.01	0.	1.01	18.10	218	.02	.01	.01	15.
1.01	5.45	69	.01	0.00	.01	0.	1.01	18.15	219	.02	.01	.01	6.
1.01	5.50	70	.01	0.00	.01	0.	1.01	18.20	220	.02	.01	.01	5.
1.01	5.55	71	.01	.00	.01	0.	1.01	18.25	221	.02	.01	.01	4.
1.01	6.00	72	.01	.01	.01	1.	1.01	18.30	222	.02	.01	.01	4.
1.01	6.05	73	.07	.06	.01	2.	1.01	18.35	223	.02	.01	.01	4.
1.01	6.10	74	.07	.06	.01	17.	1.01	18.40	224	.02	.01	.01	4.
1.01	6.15	75	.07	.06	.01	19.	1.01	18.45	225	.02	.01	.01	4.
1.01	6.20	76	.07	.06	.01	19.	1.01	18.50	226	.02	.01	.01	4.
1.01	6.25	77	.07	.06	.01	19.	1.01	18.55	227	.02	.01	.01	4.
1.01	6.30	78	.07	.06	.01	19.	1.01	19.00	228	.02	.01	.01	4.
1.01	6.35	79	.07	.06	.01	19.	1.01	19.05	229	.02	.01	.01	4.
1.01	6.40	80	.07	.06	.01	19.	1.01	19.10	230	.02	.01	.01	4.
1.01	6.45	81	.07	.06	.01	19.	1.01	19.15	231	.02	.01	.01	4.
1.01	6.50	82	.07	.06	.01	19.	1.01	19.20	232	.02	.01	.01	4.
1.01	6.55	83	.07	.06	.01	19.	1.01	19.25	233	.02	.01	.01	4.
1.01	7.00	84	.07	.06	.01	19.	1.01	19.30	234	.02	.01	.01	4.
1.01	7.05	85	.07	.06	.01	19.	1.01	19.35	235	.02	.01	.01	4.
1.01	7.10	86	.07	.06	.01	19.	1.01	19.40	236	.02	.01	.01	4.
1.01	7.15	87	.07	.06	.01	19.	1.01	19.45	237	.02	.01	.01	4.
1.01	7.20	88	.07	.06	.01	19.	1.01	19.50	238	.02	.01	.01	4.
1.01	7.25	89	.07	.06	.01	19.	1.01	19.55	239	.02	.01	.01	4.
1.01	7.30	90	.07	.06	.01	19.	1.01	20.00	240	.02	.01	.01	4.
1.01	7.35	91	.07	.06	.01	19.	1.01	20.05	241	.02	.01	.01	4.
1.01	7.40	92	.07	.06	.01	19.	1.01	20.10	242	.02	.01	.01	4.
1.01	7.45	93	.07	.06	.01	19.	1.01	20.15	243	.02	.01	.01	4.
1.01	7.50	94	.07	.06	.01	19.	1.01	20.20	244	.02	.01	.01	4.
1.01	7.55	95	.07	.06	.01	19.	1.01	20.25	245	.02	.01	.01	4.
1.01	8.00	96	.07	.06	.01	19.	1.01	20.30	246	.02	.01	.01	4.
1.01	8.05	97	.07	.06	.01	19.	1.01	20.35	247	.02	.01	.01	4.
1.01	8.10	98	.07	.06	.01	19.	1.01	20.40	248	.02	.01	.01	4.
1.01	8.15	99	.07	.06	.01	19.	1.01	20.45	249	.02	.01	.01	4.
1.01	8.20	100	.07	.06	.01	19.	1.01	20.50	250	.02	.01	.01	4.
1.01	8.25	101	.07	.06	.01	19.	1.01	20.55	251	.02	.01	.01	4.
1.01	8.30	102	.07	.06	.01	19.	1.01	21.00	252	.02	.01	.01	4.
1.01	8.35	103	.07	.06	.01	19.	1.01	21.05	253	.02	.01	.01	4.
1.01	8.40	104	.07	.06	.01	19.	1.01	21.10	254	.02	.01	.01	4.
1.01	8.45	105	.07	.06	.01	19.	1.01	21.15	255	.02	.01	.01	4.
1.01	8.50	106	.07	.06	.01	19.	1.01	21.20	256	.02	.01	.01	4.
1.01	8.55	107	.07	.06	.01	19.	1.01	21.25	257	.02	.01	.01	4.
1.01	9.00	108	.07	.06	.01	19.	1.01	21.30	258	.02	.01	.01	4.
1.01	9.05	109	.07	.06	.01	19.	1.01	21.35	259	.02	.01	.01	4.
1.01	9.10	110	.07	.06	.01	19.	1.01	21.40	260	.02	.01	.01	4.
1.01	9.15	111	.07	.06	.01	19.	1.01	21.45	261	.02	.01	.01	4.
1.01	9.20	112	.07	.06	.01	19.	1.01	21.50	262	.02	.01	.01	4.
1.01	9.25	113	.07	.06	.01	19.	1.01	21.55	263	.02	.01	.01	4.
1.01	9.30	114	.07	.06	.01	19.	1.01	22.00	264	.02	.01	.01	4.
1.01	9.35	115	.07	.06	.01	19.	1.01	22.05	265	.02	.01	.01	4.
1.01	9.40	116	.07	.06	.01	19.	1.01	22.10	266	.02	.01	.01	4.
1.01	9.45	117	.07	.06	.01	19.	1.01	22.15	267	.02	.01	.01	4.
1.01	9.50	118	.07	.06	.01	19.	1.01	22.20	268	.02	.01	.01	4.
1.01	9.55	119	.07	.06	.01	19.	1.01	22.25	269	.02	.01	.01	4.
1.01	10.00	120	.07	.06	.01	19.	1.01	22.30	270	.02	.01	.01	4.
1.01	10.05	121	.07	.06	.01	19.	1.01	22.35	271	.02	.01	.01	4.
1.01	10.10	122	.07	.06	.01	19.	1.01	22.40	272	.02	.01	.01	4.

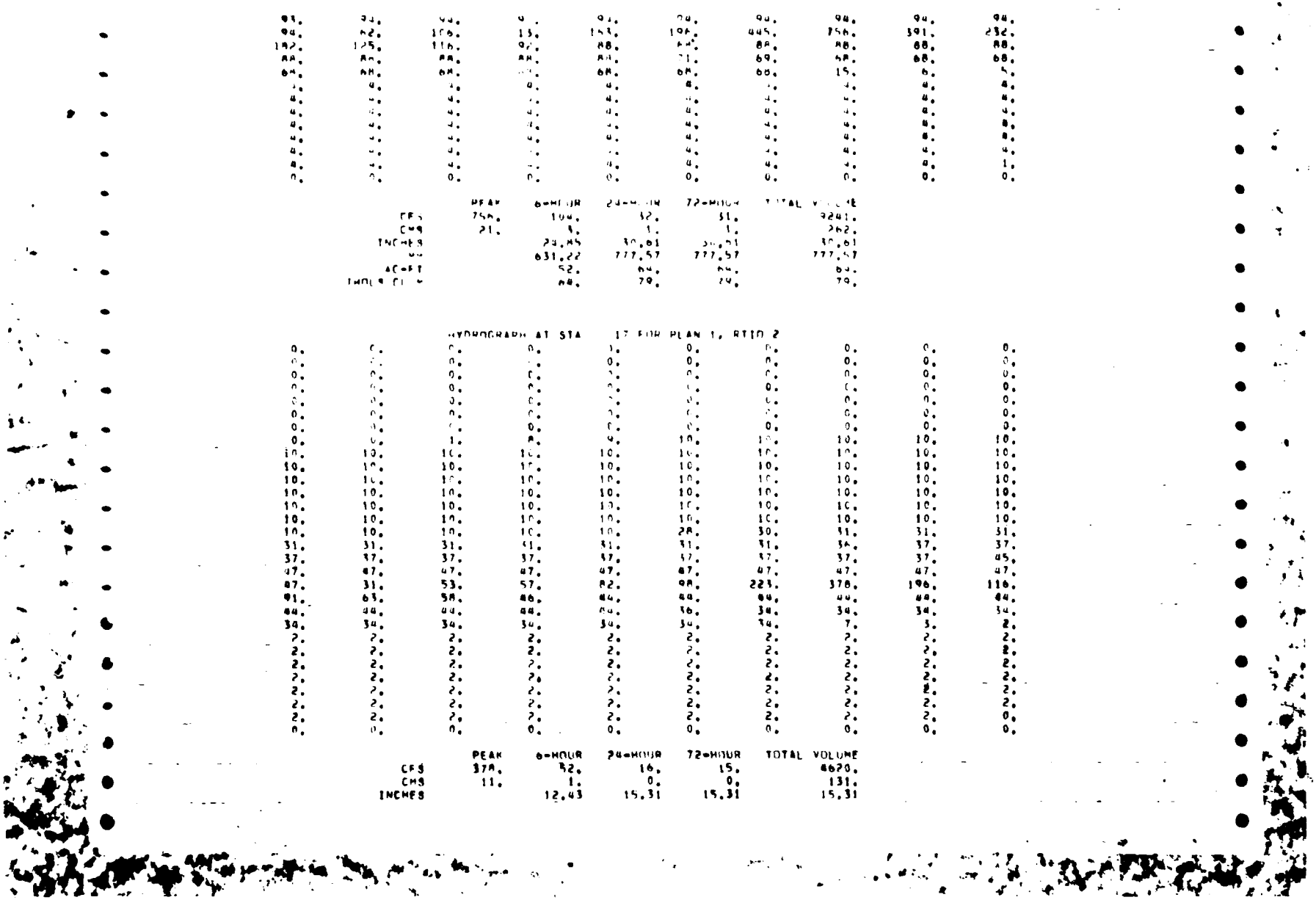
1.01	10.15	123	.07	.06	.01	19.	1.01	22.45	273	.02	.01	.01	4.
1.01	10.20	124	.07	.06	.01	19.	1.01	22.50	274	.02	.01	.01	4.
1.01	10.25	125	.07	.06	.01	19.	1.01	22.55	275	.02	.01	.01	4.
1.01	10.30	126	.07	.06	.01	19.	1.01	23.00	276	.02	.01	.01	4.
1.01	10.35	127	.07	.06	.01	19.	1.01	23.05	277	.02	.01	.01	4.
1.01	10.40	128	.07	.06	.01	19.	1.01	23.10	278	.02	.01	.01	4.
1.01	10.45	129	.07	.06	.01	19.	1.01	23.15	279	.02	.01	.01	4.
1.01	10.50	130	.07	.06	.01	19.	1.01	23.20	280	.02	.01	.01	4.
1.01	10.55	131	.07	.06	.01	19.	1.01	23.25	281	.02	.01	.01	4.
1.01	11.00	132	.07	.06	.01	19.	1.01	23.30	282	.02	.01	.01	4.
1.01	11.05	133	.07	.06	.01	19.	1.01	23.35	283	.02	.01	.01	4.
1.01	11.10	134	.07	.06	.01	19.	1.01	23.40	284	.02	.01	.01	4.
1.01	11.15	135	.07	.06	.01	19.	1.01	23.45	285	.02	.01	.01	4.
1.01	11.20	136	.07	.06	.01	19.	1.01	23.50	286	.02	.01	.01	4.
1.01	11.25	137	.07	.06	.01	19.	1.01	23.55	287	.02	.01	.01	4.
1.01	11.30	138	.07	.06	.01	19.	1.02	0.00	288	.02	.01	.01	4.
1.01	11.35	139	.07	.06	.01	19.	1.02	.05	289	0.00	0.00	0.00	4.
1.01	11.40	140	.07	.06	.01	19.	1.02	.10	290	0.00	0.00	0.00	1.
1.01	11.45	141	.07	.06	.01	19.	1.02	.15	291	0.00	0.00	0.00	0.
1.01	11.50	142	.07	.06	.01	19.	1.02	.20	292	0.00	0.00	0.00	0.
1.01	11.55	143	.07	.06	.01	19.	1.02	.25	293	0.00	0.00	0.00	0.
1.01	12.00	144	.07	.06	.01	19.	1.02	.30	294	0.00	0.00	0.00	0.
1.01	12.05	145	.21	.21	.01	19.	1.02	.35	295	0.00	0.00	0.00	0.
1.01	12.10	146	.21	.21	.01	55.	1.02	.40	296	0.00	0.00	0.00	0.
1.01	12.15	147	.21	.21	.01	61.	1.02	.45	297	0.00	0.00	0.00	0.
1.01	12.20	148	.21	.21	.01	62.	1.02	.50	298	0.00	0.00	0.00	0.
1.01	12.25	149	.21	.21	.01	62.	1.02	.55	299	0.00	0.00	0.00	0.
1.01	12.30	150	.21	.21	.01	62.	1.02	1.00	300	0.00	0.00	0.00	0.

SUM 33.15 30.70 2.45 9196.
(842.)(780.)(62.)(260.40)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	756.	103.	32.	31.	9241.
CMS	21.	3.	1.	1.	262.
INCHES		24.85	30.61	30.61	30.61
MM		631.22	777.57	777.57	777.57
AC-FT		52.	64.	64.	64.
THOUS CU M		64.	79.	79.	79.

HYDROGRAPH AT STA 17 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	2.	17.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	55.	61.	62.	62.	62.
62.	62.	62.	62.	62.	62.	62.	73.	74.	75.
75.	75.	75.	75.	75.	75.	75.	75.	75.	91.



	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	758.	104.	52.	51.	9241.
CMS	21.	3.	1.	1.	262.
INCHES		29.85	30.61	30.61	30.61
		631.22	777.57	777.57	777.57
AC-FT		52.	64.	64.	64.
THOUS CU M		64.	79.	79.	79.

HYDROGRAPH AT STA 17 FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	378.	52.	16.	15.	4620.
CMS	11.	1.	0.	0.	131.
INCHES		12.43	15.31	15.31	15.31

MM	315.61	388.79	388.79	388.79
AC-FT	26.	32.	32.	32.
THOUS CU M	32.	39.	39.	39.

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HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH 262 DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
17	1	0	0	2	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-600.	-1

STAGE	600.0	601.4	602.8	604.1	604.5	604.7	605.3	606.0
FLOW	0.	32.	203.	481.	600.	718.	1179.	2692.
CAPACITY=	0.	31.	51.	92.	202.			
ELEVATION=	574.	600.	605.	610.	620.			

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
600.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
604.5	0.0	0.0	0.

STATION 17, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	1.	2.	2.	3.	3.	4.
4.	5.	5.	6.	6.	7.	7.	8.	8.	9.
9.	9.	10.	10.	10.	11.	11.	11.	11.	12.
12.	12.	12.	13.	13.	13.	13.	14.	14.	14.
14.	14.	15.	15.	15.	15.	15.	15.	15.	16.
16.	16.	16.	16.	16.	16.	16.	16.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
18.	18.	18.	18.	18.	18.	20.	21.	23.	24.
25.	27.	28.	29.	30.	31.	34.	40.	46.	51.
55.	59.	62.	64.	66.	68.	69.	70.	71.	73.
77.	80.	82.	84.	86.	88.	89.	90.	90.	91.

SUMMARY OF PMF AND ONE-HALF PMF FLOOD ROUTING

AND

DAM SAFETY ANALYSIS

PEAK FLOW AND STORAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2
				1.00	.50
HYDROGRAPH AT	17	.04	1	756.	378.
	(	.10)		1. 1(	10.70)(
ROUTED TO	17	.04	1	755.	147.
	(	.10)		9.76)(	4.15)(

FURNISHED TO DDC

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 **********

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	600.00	600.00	604.50
STORAGE	51.	51.	51.
OUTFLOW	0.	0.	600.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV.	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE ACRE-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	603.41	.00	70.	545.	0.00	15.75	0.00
.50	602.31	.00	61.	147.	0.00	15.83	0.00


DATE
ILME
8